

BOOKS FOR THE PEOPLE.

No. 7.



"CLEANLINESS IS NEXT TO GODLINESS."

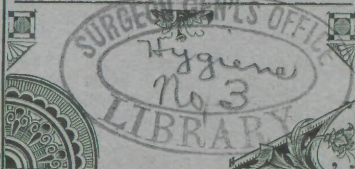
✦ SIMPLE SUGGESTIONS ✦

CONCERNING

HEALTH

WHICH IS

WEALTH



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SIMPLE SUGGESTIONS

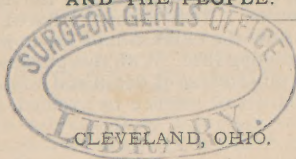
CONCERNING

✓
HEALTH ÷ WHICH ÷ IS ÷ WEALTH.

FROM "THE YOUTH'S HEALTH BOOK."

"Reason's whole pleasure, all the joys of sense, lie in three words:
Health, peace and competence."—POPE.

ORGANIZED BY THE BUSINESS MEN FOR THEIR EMPLOYEES,
AND THE PEOPLE.



1882.

SIMPLE SUGGESTIONS ON HEALTH.

FROM "THE YOUTH'S HEALTH BOOK."

INTRODUCTION.

Young as well as old people should know that most of the worst diseases which torment life, and frequently cause death, may be prevented by themselves. Children in the full glow of health think of illness, if they think of it at all, as a something, no doubt, very disagreeable to have, but about which they need not trouble themselves until it comes to trouble them. Having full confidence in their parents and the family medicine-chest, with the doctor and apothecary ready to aid in any emergency, future disease has little terror for the youthful imagination. With the indifference to all forebodings of ill habitual to youth, with its absorbing interest in present enjoyment—children are ordinarily reckless of any effect which their own conduct may have upon their health. They can, however, and ought to be made to, understand that it depends greatly upon themselves whether they are to be strong and hearty, or weak and miserable, or, in fact, to live or die. The preservation of their health should be inculcated upon them as a moral duty; for their usefulness in the world, and therefore the fulfillment of the great purpose of their creation, will depend upon it.

Those who are practiced in the training of children know well that they are not to be taught their duty by the mere statement, however impressively made and frequently repeated, of their moral obligations. The child requires to have pointed out to him what to do in each particular case, and to precept upon precept should be added demonstration upon demonstration, until he acquires not only the familiarity of knowledge, but the habit of action. This is the motive of this little book, in which it will be shown how the child should act in his daily conduct so as to enjoy health and prolong life. With this purpose in view, the directions will be given with minuteness of detail and simplicity of language; and though the technicalities of science be avoided, its principles shall be carefully regarded.

CHAPTER I.

Air.—Its Necessity to Life.—Fatal Consequences of Disregard of this Fact.—Bad Habit of Children.—Dangerous Amusements.—Quantity of Air Required.—Modes of Suffocation.—Examples.—Stifled in School-rooms.—The Black Hole of Calcutta.

The air which covers all this round earth, extending from its surface to a height above our heads of more than forty miles, is found almost everywhere in a fit state for immediate service. The first as the last effort of life is a gasp for air, and if it fails, death is the consequence. A mother, during the winter, starting on a sleigh-ride of some distance, and carrying her baby (a few months old) with her, wrapped it up so closely in shawls and furs; and hugged it so tightly, lest its tenderness should be touched by the biting frost that at the end of the journey, on opening the carefully guarded envelope, she found that it contained a—corpse!

It seems less surprising that thoughtless children should be so foolish or careless as often to deprive themselves of the quantity of air necessary to freedom of breathing, and do a serious injury to their health, and sometimes even endanger their lives.

They certainly injure their health by burying themselves in their beds and bed-coverings; and worse consequences, even death, would often result from this bad habit, were it not that in most cases a feeling of oppression forces the little simpletons, in spite of their own resolutions, to wriggle out of their self-made tombs, and gasp instinctively for fresh air. It may well be believed that this habit is frequently the cause of those headaches, nervous troubles, and diseases of the brain with which so many young people are afflicted.

Boys have been known, in their mischievous playfulness, to heap upon a not unwilling comrade such a quantity of hay, and to sit down upon it (all in the best humor and with the most innocent intentions in the world) so firmly as to stifle every cry and struggle of the victim, until finally he has been drawn out a livid corpse. Another mode of smothering is to hold his hands or put his handkerchief over the nose and mouth of a comrade and stop his breathing. His suffering, however, is unmistakably clear in the convulsive agitation of his whole body, and the livid face suffused with black blood.

It has been calculated that the proper quantity of air for a human being each day of twenty four hours would measure three hundred and sixty cubic feet. If he does not get all this, he suffers. The story is familiar of the poor girl in the ballad of "The Mistletoe Bough:"

"Oh, sad was her fate! In sportive jest,
She had hid from her lord in the old oak chest;
It closed with a spring, and her bridal bloom
Lay withering there in a living tomb."

Whether any one is thus shut up in a place where there is little or no air, or he is prevented from breathing it where it may be in the greatest abundance, as was Desdemona by the jealous and cruel Othello, who suffocated her, while in bed, by holding a pillow over her mouth and nostrils, the result is the same—death.

If children are deprived of sufficient air, as they often are in the school, bed, and other rooms to which they are confined, it is ordinarily the fault of the older folk who have charge of them. All boys and girls are advised to leave the school-room as soon as they have finished their lessons, and never remain in it to play, as they often do. If, however, the weather or peremptory order keeps them within doors, then let them by all means open the windows, or ventilators, if by chance there should be any such useful contrivances, that they may romp, and pull, and toss, and tumble at their will, without the danger of being stifled to death for want of air, which they consume faster and faster as they are more and more crowded together and active in exercise.

Let them take warning from the horrors of the Black Hole of Calcutta, a small prison-house, in which Surajah Dowlah, the cruel Indian ruler of Bengal, thrust, one night, one hundred and fifty English prisoners. In the morning, only twenty-three remained alive, the rest having been suffocated to death by the closeness and narrowness of the dungeon, in which there was no room to move and no air to breathe. This atrocity, which was committed more than one hundred years ago, and dreadfully avenged on the battle field of Plassey by Lord Clive, is still fresh in the memories of Englishmen, and it would be well for Americans to fix it in their minds as an illustration of the necessity of air and space for living beings.

CHAPTER II.

Composition of the Atmosphere.—Oxygen.—Carbonic Acid Gas.—Its Dangers and Benefits.—Medicinal Springs.—Carbonic Acid Gas in Nature.—The Dog's Grotto.—Carbonic Acid in Wells.—Dangers: how avoided.—Effect of Plants on Carbonic Acid.

The principal parts of the air or atmosphere are the two gases termed "nitrogen" and "oxygen." The former of these is an important element of creation; but the latter (oxygen) is absolutely necessary to the breath of life, and is thus often called "vital air." It, however, unless mixed, as it is ordinarily in the atmosphere, with other gases and vapors, is too strong for continued breathing, and would, if not thus diluted, soon cause death.

Besides oxygen and nitrogen, pure air properly constituted for breathing, always contains a quantity, in varying proportions, of carbonic acid gas. This acts as a most deadly poison upon living beings when breathed alone. No air can be safely breathed by human beings which contains a larger proportion of carbonic acid than one volume in a thousand. Its deadly action when unmixed is shown by the effect of charcoal burning in a tightly closed room containing a living creature. The coal (called by chemists "carbon"), in burning, unites with the oxygen of the air, and forms carbonic acid gas. This process goes on until all the vital element of the atmosphere of the shut-up apartment, with the consumption of the fire and the breathing of the occupant, is exhausted, and nothing is left but the deadly gas. Life being impossible under such circumstances, death, of course, ensues. It may, indeed, be truly said that no one can remain safely for a long time, and certainly not

sleep, in any enclosure containing a fire or light, and into which the outward air cannot enter more or less freely.

Carbonic acid gas is positively wholesome, as when, for example, it is swallowed in combination or union with various drinks used as medicine or beverage. The sparkling liveliness of champagne, and of beer and cider, is due to the carbonic acid gas, which is produced in them in the course of fermentation, while the effervescence of soda-water comes from the same pumped into it. For this purpose, the carbonic acid gas is obtained by pouring oil of vitriol (sulphuric acid) upon powdered marble. The marble is known by chemists as carbonate of lime, which is composed of lime and carbonic acid. As soon as the vitriol touches the marble, it takes away the lime and sets free the carbonic acid gas, which rises like steam or vapor from boiling liquids, and being collected, is then passed into bottles, other vessels, or fountains containing water, which thus becomes that sparkling and agreeable beverage known as soda-water.

Carbonic acid gas is contained in a great many natural springs, and renders their waters not only more pleasant, but wholesome to drink. Saratoga and other medicinal waters of our country, as well as the Seltzer, Vichy, and a great many besides of foreign lands, contain a considerable portion of carbonic acid gas. The water which we ordinarily drink, moreover, must have some of this gas, or it will not be palatable.

Although nature supplies such an abundance of pure air, or what is fit for human beings to breathe, it also, in some comparatively few places, produces various vapors and gases which no one could take into his lungs without danger certainly, and probably fatal result, to life. Carbonic acid gas is one of the most common of these natural products, as is clear from its being so generally found in the medicinal springs abounding in many countries.

There was a spot in Italy, visited not many years ago by most travelers, called the *Grotto del Cane*, or Dog's Grotto, where it was customary for the guide or attendant to make a cruel show of the poisonous power of the carbonic acid gas which nature supplied there in much abundance and of great intensity. He had a dog which, on the payment of a small fee, he would let down by a rope to the bottom of a chasm or crevice and pull up again, now either quite dead, or with so little life as to appear so.

The carbonic acid gas, from its greater weight than the air of the atmosphere, will often collect and remain in crevices, caverns and deep holes of all kinds. It is apt to gather at the bottom of old wells; and if these are descended incautiously, as they often are by persons ignorant of the consequences, they will be certainly poisoned, and probably instantly killed. Even people of ordinary experience, without the least pretense to a knowledge of science, will not enter a well of any kind, for whatever purpose, without first testing its safety for descent by letting down into it a lighted candle. If this continues to burn, it is regarded as safe; if not, as exceedingly dangerous to descend.

By a beautiful provision, this gas, so poisonous to man and other animals, becomes a source of health and vigor to the vegetable world.

Trees, bushes and plants of all kind, so far from taking harm from carbonic acid, derive from it what is essential to their existence. They breathe in the gas, and, by means of a power within themselves, separate it into its two parts, keeping the carbon which forms the chief portion of their substance for their own use, and giving out the oxygen, so necessary to animal life. Thus vegetables purify the atmosphere. During the night plants give out carbonic acid; though small in quantity, it may be injurious to health.

CHAPTER III.

Carbonic Acid produced by Man.—Respiration.—Purpose of Inspiration.—Purpose of Expiration.—Pure Air the Antidote to Carbonic Acid.—Penetrating Power of Air.—Ventilators.—Summer and Winter Ventilation.—Atmospheric Impurities.—The Suffocation of the Elder Pliny.—Herculaneum and Pompeii.—Miasm.—Fever and Ague.—Poisons from the Household.—Poisons of Cities: Smoke; Dust; Gas.

The carbonic gas produced by man and other animals is the same as that found in the Dog's Grotto, in certain natural caves, crevices, holes, and at the bottom of wells, and exercises its harmful and deadly influence in exactly the same manner. One of the chief purposes, in fact, of breathing is to get rid of it.

Breathing consists of two processes, performed in man by means of the lungs and chest—one called inspiration, or breathing in; and the other, expiration, or breathing out. When we breathe in, or inspire, pure air (which we ought always to do if possible), we take in principally a supply of oxygen, which is essential to life. When, on the contrary, we breathe out, or expire, we throw off carbonic acid, a gas, as we now know, very injurious in certain proportions, and often fatal to life. The oxygen of the air that is breathed in is mostly used in the body for heating it, and purifying the blood, and this can only be done by taking the carbon it finds there and burning it, which, in fact, means no more than uniting with it and forming carbonic acid gas. This, being produced in the body—and of no use there—is breathed out. Thus it is that every living being may be truly said to be a source of poison. Many people would seem to be either ignorant of the necessity of pure air, or too indolent to get it, although they need do no more than open the window to a crack, or put the door ajar, in order to have all that may be required.

This pure air, which acts so beneficent a part—giving us life, on the one hand, and warding off death, on the other—is treated as if it were the greatest enemy of the human race. People fasten down their windows and shut close their doors against it, and seem determined that it shall not enter their houses. Such is the penetrating power of air, that it will pass through walls of not only brick and mortar, but even of stone; and there are, moreover, always providential cracks, crevices and holes of some kind, through which it will gain a more or less free entrance. No building which is to be occupied by living beings ought to be regarded as complete without ventilators, as those contrivances for letting in the pure air from without, and letting out the foul air from within, are called. Even if these are not provided, no one need, if he

has a window or a door in his house, be deprived of all the air required. Many more are injured by too little rather than too much air.

If there is an open fireplace, with a free vent through a broad chimney, and a fire burning, there may be no necessity for opening the door or windows, for this itself is a very good ventilator. In winter, when the house is kept well-heated, there is always a freer ventilation than in summer; for in the former case is generally a draught from the colder atmosphere without to the warmer within, while in the latter it is reversed, if there should be any; but there is generally a complete stagnation of air.

In volcanic regions, in mines and other places, various gases and vapors are set free. These often prove injurious to the health and destructive of the life of man. During the great eruption of Mount Vesuvius which destroyed Herculaneum and Pompeii, nearly eighteen hundred years ago, more lives were destroyed by the poisonous gases which issued from the burning mountain than by the floods of hot lava and the volcanic showers, which poured down such enormous quantities of ashes and masses of pumice-stone as to bury those beautiful cities so deeply that no trace of their ruins was observed for 1,000 years.

The younger Pliny, as he is called, barely escaping, with his mother, from the doomed cities, lived to record the death, on that occasion, of his less fortunate uncle, the elder Pliny, a famous Roman writer on natural history, and a distinguished naval officer. The nephew, in a charming letter, written when he was only eighteen years old, thus describes the fatal occurrence:

"On the 24th of August, A.D. 79, shortly after twelve o'clock, an immense cloud was observed to rise over the mountain, in the form of a pine-tree—partly of a white, partly of a dark color, which came from the ashes it carried with it. The elder Pliny went with several galleys to the assistance of those whose villas were situated at the foot of Mount Vesuvius. As he approached the shore, the cinders, which grew thicker and hotter, fell into the ships, together with pieces of pumice and some larger stones. At length the shallowness of the water prevented him from landing, as the sea had retreated from the shore. A strong northwest wind had sprung up, which drove him to Stabiae, about three miles distant from Pompeii. The falling of ashes and pumice continued the whole night, and grew more and more violent. Several large streams of lava broke forth from the mountain, and Pliny was obliged to resolve upon leaving the house in Stabiae, to avoid being overwhelmed by the showers of stones and ashes.

"They went out, having large pillows tied upon their heads, as a protection in the open air. It was on the 25th of August, in the morning, and the eruption continued to increase, and at last reached such a height that a most fearful explosion took place, during which the stream of lava was emitted which entirely overwhelmed Herculaneum. This explosion drove the followers of Pliny to flight; but as he was stout and short of breath, he instantly fell down dead, being suffocated by some gross and noxious vapor."

The total number of persons killed by the destruction of Herculaneum and Pompeii is estimated at 1,500; of these the greater part were suffocated, as they sought refuge, in the interior of their houses.

Many thousands lose their lives every year in the English mines by being suffocated or blown up with choke-damp, or other explosive and poisonous gases.

"Miasm," or "malaria," which signifies bad air, arises from damp places, ponds, swamps, streams and rivers, and is supposed to be produced by the decay of vegetable matter of every kind when acted upon by heat and moisture. It prevails mostly in newly occupied regions which have not yet been thoroughly cultivated. It disappears generally in the United States with the increase of the number of inhabitants and the full development of the habits of civilization. The clearing of the land and its drainage seem to be the surest means of preventing the generation of miasm. It still prevails, however, in some of the oldest countries, as in the Pontine marshes of Italy, in the neighborhood of Rome, and which so infects its atmosphere that a residence at certain periods of the year in that famous city is excessively dangerous to most strangers.

The most familiar result of breathing this miasm is the fever and ague, to which habit has so familiarized many of our outlying fellow-citizens, that they make quite light of it, and when consoled with on the score of their sufferings from the disease, and the cadaverous looks which it gives, they will answer as firmly as their bloodless and trembling lips will allow, "It is only the shakes." The fever and ague, however, though its fits are possibly not difficult, with long practice, to endure, is a serious disease, inasmuch as frequent attacks will greatly weaken the strongest constitution, and often do permanent injury to some of the vital organs of the body.

Where miasm prevails, the best means of avoiding its ill effects is to keep up good fires in the house during the spring and fall, or autumn—for these are the seasons when it abounds—even though the cold is not sufficiently great to seem to require them. It is prudent, moreover, to keep away, particularly in the early morning and during every hour of the night, from all rivers, creeks, ponds and marshes, which generate the miasmatic poison. Old and experienced people are generally wise enough to do so, but young folk are very apt to neglect this and every other precaution against danger to health. Children should hurry away from the river, stream or pond, in which they delight to sport, and not linger about their banks or borders; and, as soon as the sun sets, they should try to get under the snug cover and within the comfortable warmth of home before the miasm begins to infect the atmosphere. This will be particularly necessary if they happen to have a wet jacket or wet boots or shoes (which they ordinarily do, if there be any possible means of getting them), since the least chill from cold and moisture will make them more liable to catch the fever and ague, or any other disease caused by malaria.

The air we breathe is more or less poisoned by the daily work necessary in every household, shop and factory. There is not a fire or light burning which does not send out a poisonous vapor or gas. In England a law forces every proprietor of a large furnace or manufactory to use a contrivance for the consumption of the smoke that may be produced in the course of the operations carried on in those establishments. Such a

law should be made in every country. and it would be wise, if it were practicable, to extend it to the smoke raised in private houses, for the atmosphere of whole cities is now infected by its poisonous qualities.

Most cities, and our cities especially, are filled with producers of poisons which we take in with every breath of air. There is not only the smoke which comes out of every chimney of dwelling and factory, but there are also the reeking vapors rising from slaughter-houses, the offal and corruption which are found more or less in every street, and, besides, the polluting breath of the millions of living and of the thousands sick and dying, to make the great city a huge generator of poison.

The very dust which rises from each step taken makes the air less fit to breathe. Persons whose occupations are of such a kind as to expose them daily to various kinds of dust are apt to suffer from a special ailment which soon destroys their lives. Street-sweepers, grinders of glass and metal, coal-heavers and such like, are often affected with a disease of the lungs produced by particles of the dust to which their occupation exposes them taken in with the air they have breathed. These inflame the delicate breathing apparatus, and produce all the dire effects of the fatal consumption. On examining the lungs after death, they are generally seen to be mere dust-heaps, with all their natural substance ulcerated away, to make room for the fatal mass of stuff which has taken its place.

It may be well to remind all people, and especially the young, that the gas used for lighting purposes acts as a deadly poison if breathed. Its odor, fortunately, is very strong, and readily noticed, so that the least escape of gas will attract attention of those, at least, who may happen to be awake. As soon as the peculiar smell is observed, the safest proceeding is to open the windows at once, and let in as much air, which is the best antidote to the poison, as possible. Beware, however, of taking a lighted candle, match, or anything, in fact, which is burning, into an enclosed place where gas is suspected to have escaped, or there will be an explosion, still more certain and quick to destroy life.

CHAPTER IV.

Corruption of Air by Disease.—Contagion and Infection.—Epidemics.—Precautions.—Duty to the Sick.—Animal Heat.—Its Mode of Production.—How Regulated.—Necessity of Adapting Habits of Life to Climate and Season.

Human as well as most other animals, when diseased, corrupt the air constantly by certain emanations peculiar to their unwholesome condition.

Certain precautions may be taken by those who attend the sick to prevent what poison they produce from injuring the healthy. Plenty of pure air must be allowed to enter the sick-room, the greatest cleanliness kept, all which passes from the patient disinfected, as it is called—that is, deprived of its poisonous quality by certain substances known as disinfectants—and carefully removed from all possible chance of contact in any way with living creatures, and no person whose attendance is not absolutely necessary admitted into the same apartment with the diseased person,

Nothing so disposes a healthy person to catch a contagious or infectious disease as fright. From the East, whence came "The Arabian Nights" and many other pretty stories, in which useful truths are so invitingly arrayed in the attractive dress of fiction, comes this fable: A stranger on the road, accosting the Plague coming out of Bagdad, said, pointing to the city: "You have been doing great havoc there." "Not so great," replied the Plague; "I only killed one-third of those who died; the other two-thirds killed themselves with fright."

It ought to be remembered that the best protection against its evil consequences is a courageous spirit. He must not be weakened by the cravings of hunger and want of food. It may be well, too, to guard his mouth and nostrils with the breathing apparatus commended by an eminent philosopher (Tyndall) of London, who, holding that contagious and infectious diseases are conveyed from the ill to the well by means of germs, or seeds, floating in the air, supposes that they may be thus stopped on their course to the mouth and lungs, and prevented from poisoning the body. The handkerchief, or some flocks of cotton or wool, will answer the purpose if the more artificial contrivance is not at hand.

When such diseases as have been spoken of, and others like the cholera and plague, fall upon a great number of people at the same time, they are called epidemic, from two Greek words, meaning *upon* and *people*. It is during the prevalence of an epidemic that it especially behooves every one to be careful of his general health, to reform such habits as he may have which weaken force and predispose to disease, and avoid excess or imprudence of any kind, such as extraordinary indulgence in eating or drinking, unusual strains of the strength likely to cause much fatigue, and exposure to rough weather, and sudden changes of heat and cold.

Hidden, however, from human knowledge as is the cause of an epidemic, its worst effects are within the power of human wisdom to ward off, to a great extent. By obeying strictly the laws of health, which it is the purpose of this little book to set forth, the worst diseases, come as they may, can be boldly defied.

There is another mystery connected with the history of contagious and infectious diseases. It is this well-known fact, that a person is not attacked more than once by any of these diseases, as the small-pox, measles, and the scarlet, typhus, and typhoid fevers. This, though a general, is not an absolute law without exceptions. Sir Robert Christison, a famous professor of the University of Edinburgh, was so peculiarly liable to typhus fever that he was forced to give up his attendance as a physician upon any patient affected by it, for he found, after a series of half a dozen or so attacks, that it was not possible for him to expose himself to the disease without getting it.

Such exceptions, however, are so rare, that those persons who have once had a contagious or infectious disease may presume that they will not get it a second time, and can accordingly, without reasonable fear, attend upon their friends, or other people calling for their good services, who are afflicted with it.

Most young, and probably old people have no idea of any heat except that which comes from the sun, fires of all kinds, and, as they suppose, from warm coverings, such as the furs and feathers of animals, and the clothes worn by human beings during the day, and the bed and bedding in which they lie at night. Human beings, and in fact all living creatures, make themselves the heat which is most necessary to them. They are all provided with furnaces, as they may be called, within their bodies, which continue to burn as long as they breathe, and only go out with life. So well regulated, moreover, is this internal fire, that to whatever degree of cold the external parts of his body may be exposed, the living being, if provided with the ordinary essentials to healthful life, continues to get within himself all the heat he requires. So that whether his skin is scorched by the blazing sun of the tropics, or shrinks from the withering touch of the arctic frost, the internal furnace keeps the interior of the body at nearly the same uniform warmth.

The internal warmth of the living body, or animal heat as it is called, is produced and regulated to a considerable extent by the process of breathing.

The fuel which supplies the human furnace is obtained chiefly from the food, and is essentially the same substance as is burned in ordinary fires. It is carbon, or charcoal, and comes from the fatty portions of the meat, vegetables, and other articles of food eaten, and the alcoholic fluids of various kinds drunk by man. The animal furnace is supposed to be regulated and adapted to varying climates by means of the action of the body, the air, and diet. In order to keep a uniform temperature, whatever may be the degree of external warmth or cold, it is obviously necessary to vary the quantity of heat produced. In cold climates and cold weather, a greater supply, and in hot climates and hot weather a less will be required. In the former, accordingly, a much greater stock of carbon, or charcoal, should be taken in; and as this is found in the largest quantity in fatty food, such would appear to be the most appropriate for cold regions and seasons. This seems to be confirmed by the greater inclination for such food under these circumstances, and the apparently instinctive fondness of the Esquimaux and other inhabitants of arctic countries for whale-oil, seal-blubber, tallow-candles, and soap-fat.

To consume the abundant carbon, or fuel, thus supplied—for fat of all kinds, it must be remembered, is chiefly made up of this charcoal—there must be, in order to keep agoing the brisk internal fire required for the large quantity of animal heat necessary to living beings in cold seasons, a great abundance of oxygen. This nature takes care to furnish, by means of the more condensed or closer packed atmosphere which is found during winter and in arctic regions. A greater quantity of the oxygen, without which the fires in the inside of the body, as in the ordinary ones, will not burn at all, is thus supplied. Cold, moreover, promotes activity, and especially impels to brisk exercise of the body, and consequent greater quickness of breathing. The respiration thus not only becomes more rapid, but at each inspiration the air taken into the lungs contains a larger proportion of oxygen.

In summer and in warm regions, the opposite occurs. The atmosphere is rarer, or less closely packed, and contains in the same place less oxygen, so that in each inspiration there is a smaller quantity of it breathed into the lungs. The disinclination, moreover, to activity, and the general habit of indolence, which are common to people living in hot climates, and even to the inhabitants of temperate latitudes during the season of summer, cause them to breathe less frequently, and consequently tend, together with the rarer atmosphere, to diminish the supply of oxygen.

The fuel, too, is ordinarily greatly decreased by the kind of food generally preferred and eaten by people during the warm weather, which prevails in the summer of temperate, and in all seasons of tropical climates. In fact, the inhabitants of many hot climates live almost exclusively on rice, fruits, and other products of a vegetable kind.

Many an Englishman, bred amidst the chilly fogs of London, to beef, pork, and porter, goes to live in India, and persists, while weltering in the sweat of its prevailing heat, in gorging himself with his habitual abundance of solid food and profusion of strong drink. He at the same time is forced by the warmth of the climate to a necessary repose and indolence, and to breathe an atmosphere poorly supplied with oxygen. The excess of carbon taken into his body not being consumed for want of enough oxygen for the purpose, and therefore not escaping in the usual form of carbonic acid gas from the lungs, is retained within him, and cast, like so much waste matter, into the most convenient receptacle found in his interior. This is ordinarily the liver, which thus becomes a garbage-box, as it were, and a very serious nuisance it proves to be to the unhappy possessor; for the waste carbon which fills it is changed into an unwholesome greasy matter, which results in the production of a disease known to physicians as the fatty liver of India, which is so fatal to the hard-eating and deep-drinking Englishmen who have lived in that hot Eastern country.

CHAPTER V.

Evaporation.—Conduction.—Radiation.—How to retain Animal Heat.—Object of Clothing.—Good and Bad Conductors.—Winter Clothing.—Proper Clothing in Moist Weather.

When an old sailor wants to know which way the wind blows, he will first put his finger into his mouth, and then hold it up in the air. Wherever it feels coldest, as it does on one side or the other immediately, he concludes that is the direction of the wind. When asked for an explanation, he will probably, with a great expression of contempt for the landsman who has made the inquiry, gruffly answer, "Why, of course it is the breeze; don't you see, you lubber?" He is indeed right; it is the breeze; but the question is, how does it act? The change from a liquid to a vapor is greatly favored by the abundance and rapid movement of the air; so the moisture of that part of the finger which is exposed most directly to the wind, and consequently receives most air, in the quickest time, will be the first to evaporate and feel the cold produced, in consequence. Evaporation, under favorable circumstances,

will produce cold enough to form ice. Belzoni, the famous traveler, conscious of this fact, undertook, with the utmost confidence, to show the sultan that he could turn water into a solid, notwithstanding he was threatened, if he failed, with the loss of his head. He, of course, succeeded; making use of the now familiar means of an air-pump, in the receiver of which a little water being placed, and a vacuum produced, a film of ice soon made its appearance, much to the surprise of the sultan. It is usual for the people of warm climates to cool their drinking-water by keeping it in porous earthen jars, or wrapping the vessels which contain it, in moistened cloths, both of which, especially when exposed to a draught of air, favor evaporation, and consequently produce a very considerable cold.

By *conduction* we are to understand that process by which heat passes through bodies, living or otherwise; and it is common to call such bodies "good conductors" and bad conductors," according to the ease and quickness with which they allow of its passage. Wooden handles are fixed to the iron poker with which the fire is stirred; a pad of cloth is put on the holder of a flat-iron in ironing clothes; no one attempts to take a boiling pot from the fire with the hand until it is guarded with a cloth of some kind; and the parlor tea-urn would burn the delicate dame who serves it if there were not a bit of ebony, ivory, or some other bad conductor, let in between the handle and the body of the vessel which contains the hissing-hot fluid, to prevent its heat from passing to the fingers that grasp it.

Radiation is the process by which heat passes from a body apparently in *radii*, or rays. The rude pictures of the sun seen upon sign-boards, where a round flaming head is represented to be darting spikes of fire on all sides, will supply further illustrations of what is meant by the term "radiation." It is by waves, however, that, as we are told by the philosophers, heat passes from body to body; thus the heat of the real sun reaches us; and it is also in this way that we receive the warmth of the stoves, grates and other contrivances for heating us. The whole earth, and everything upon it, is ceaselessly radiating heat, and thus there is a constant tendency in nature to produce by this means in all objects, living or otherwise, an equality of temperature; but the effort is checked by other processes, such as the evaporation and conduction, of which we have spoken. The greater coldness of the night is due to the larger degree of radiation from the earth of heat, in proportion to what it then receives from the sun than during the day. The inhabitants of India make a useful application of this fact. They expose shallow pans filled with water to the night air, so arranged as to favor radiation, and the cold produced is generally sufficient to cover them before morning with films of ice.

A certain degree of heat in the interior of our bodies is absolutely essential to health and life. This is generally estimated to be about 100° Fahrenheit, which is ordinarily marked upon the thermometers used in the United States as "blood-heat." In healthy human beings this should vary but little, whatever the degree of external heat or cold to which they may be exposed; and a thermometer placed in the armpit, or beneath the tongue, of a person during the coldest day of winter or the

hottest of summer ought generally to rise to this point of 100° Fahrenheit. To prevent the animal heat made within the body from escaping too quickly, and to keep it up to the degree essential to its healthy condition, certain familiar means are used. The roof that covers, the walls that enclose us, the clothes we wear, and the fires we light, are mainly for this purpose. All of these act thus beneficially, directly or indirectly, through evaporation, conduction and radiation; some chiefly by one, and others by two or three together of these processes.

The animal body, like all other bodies, has a constant tendency to lose its heat by evaporation, conduction and radiation; and if the purpose is to keep it, as of course it is, during cold weather at least, the action of these must be checked. The only purpose of dress, apart from satisfying decency and taste, is, in cold weather, to prevent the escape of the heat of our bodies. Few persons need be told that feathers, fur and wool are warmer than bare skins, cotton and linen. Furs and feathers, though the best for the purpose, being the worst conductors, are too costly for common use, and so articles made of wool are generally used. As the skin of some persons is particularly sensible to the least roughness, the smooth silk, cotton, and even linen, are often preferred to the harsher woolen materials. Of these, linen is a very good conductor, while cotton and silk are tolerably bad conductors, and are therefore preferable to it for winter wear.

The air is a very bad conductor, and the more held by any article of clothing, the less will be its power to conduct away heat. The looser, therefore, the texture of a material, the better will it be adapted for winter wear, since the greater quantity of air which the spaces between its coarsely woven threads allow it to receive will proportionately lessen its conducting power, whatever may be that of the substance of which it is composed. Cloth of wool or cotton, though these materials are naturally bad conductors, may be made a good conductor by close weaving or fineness of texture. It is probably on this account that fashion has been forced to give up the fine broadcloths, once deemed indispensable for the daily wear of the finer gentleman. He now generally keeps the superfine stuffs for the warm atmosphere of the dining-room or dancing-saloon; though, in compliance with ridiculous tradition, he may yet be seen in the coldest weather freezing in the scant swallowtail coat and thin trousers of black kerseymere in the sepulchral church at a wedding, or at the edge of an open grave at a funeral.

The make of a dress, as well as the texture of its material, will greatly affect its conducting power. A tightly fitting garment is much colder than a loosely fitting one; not only, however, because it thus becomes a better conductor by excluding the air, but also in consequence of its pressure upon the body, which prevents the free circulation of the blood, so essential to the fire-making process going on within us. The loose sack-like suit now generally worn by most of the male sex, boys as well as men, is a sensible concession of fashion to utility, which could hardly be expected from a guide which so often leads the world into absurdity. Women, however, have nothing to thank fashion for on this score, but are still, in accordance with its peremptory orders, squeezed into the narrow bodice, and tortured with the ever-tightening corset.

That their noses are nipped by each touch of cold air, and whatever is movable about them should quiver, even while fixed to the fireside, at the faintest breath, is not surprising. No good fire can be made or kept agoing in frames where there are so many obstructions to a free circulation; and warmth, of course, is no more possible than in a stove without a draught. To the torture at all times of the pressure of tight boots, shoes and gloves, with which the fools of fashion inflict themselves, will be added in winter the suffering from cold hands and feet. The power of holding air will be increased, not only by the looseness of fit of the dress, but by the greater number of its layers. In the winter, accordingly, a person does well to pile coat upon coat, and roll wrapper around and around, if he is to be exposed to severe cold, without the opportunity of active bodily exercise.

Moisture increases the conducting power of all clothing, since it drives out the air in the spaces between its threads or fibres, and thus takes the place of a worse conductor than itself. Wool absorbs moisture with less rapidity than linen, and its conducting power is therefore not so much increased by it. Whatever may be the season of the year and the temperature, a woollen dress, when exposure to wet cannot be avoided, is the safest to wear, for the heat of the body is thus less likely to be suddenly checked—an occurrence always dangerous to health, and frequently fatal to life.

CHAPTER VI.

Natural Moisture.—Overcoats.—Adaptation of Clothing to Weather.—The Duke of Wellington and his Wardrobe.—Fires and their Dangers.—Hardening.—Foolish Dread of Cold Air.—Colds: how caught and avoided.—Imprudence of Boys and Girls.—Petting Dr. Solander in the Arctic Region.—Chilblains and Frost-bites.

There is a natural moisture upon the surface of the body of every healthy person, which, like all other moisture, tends to evaporate and produce cold. If the dress, however, should by any chance become wet, its own moisture will continue to evaporate until it is dry, and necessarily produce, in the meantime, a coldness which the person who may wear it is sure to feel. It is thus that a wet jacket or any other article of clothing becomes soon uncomfortable, and, even in the warmest weather, is apt to produce a chill exceedingly dangerous to health. Young people, therefore, are earnestly urged to give more heed than they usually do to the advice of their parents and others to make haste to change their clothes, whether only damp or soaking wet, as soon as they cease all active exercise, and are about to remain at rest. It is necessary, in case of weakness from illness or a feeble constitution, to guard against all sudden changes of temperature, and, therefore, it will be well to warm each garment by the fire before it is put on, that, on being brought close to the body, it may not take away more heat than it gives.

The old Duke of Wellington is said to have had as many varieties of cloaks and overcoats as there are changes of weather. As the climate of England, where he lived, is very variable, the duke's wardrobe must have been as full of odd garments as the shop of a Chatham Street dealer

in old clothes. His Grace very sensibly resolved to adapt his dress not only to the change of season, but to the temperature varying from day to day. Accordingly, every morning, before setting out on his daily ride or walk, his well-known aquiline nose might be seen for a moment at the window just opened to a crack, testing the sensation of the weather, and taking an observation of the thermometer hanging there. He, having thus noted the temperature, would bid his valet bring him the corresponding covering. Now it would be the freezing-point fur cloak, now the forty-degree cloth coat, again the temperate light military cape, and so on through all the range of the thermometer and the wardrobe.

Every one is not a duke with an infinite clothing department at his command. Each person, however, who has two or three suits at his service would do well to adapt the use of them to the variations of the weather. The rule for young people, in the matter of the overcoat, is to put it on when they first go out of a warm room into the cold air of a severe winter's day. They may lay it aside on beginning active play, but they should resume it at once on ceasing. The habit of remaining in-doors during cold weather and "hugging the fire," as it is called, is a dangerous one. The heat obtained in this way only warms the surface of the body, and does not supply what is necessary not only for comfort, but health, and which can only be obtained through active exercise and free breathing in the open air.

"He who does not dress warmly enough must be either a fool or a beggar," is a shrewd Scotch proverb. If a person has the means to clothe himself properly, and does not do so, he is supposed to be the former; and if he has not, he cannot, and therefore may be called, in one sense, the latter. Children are very apt to laugh each other into such absurdities of conduct. With the false idea, started probably by some lad who has no warm coat to his back, and, like the fox without a tail, is anxious that all his fellows should be in the same predicament, that it is not heroic to enjoy the comforts of substantial clothing, whole schoolfuls of boys will bare themselves to every wind that blows.

The surface of the body cannot, as is often supposed, be hardened by continued exposure to cold or intemperate weather of any kind. The skin, when in a wholesome condition, is moist and soft, and, being constantly renewed, retains to a great extent its freshness and delicacy throughout life. Many people have an unnecessary dread of the cold air, which seldom, if ever, unless its temperature is so excessive as to produce frost-bites and other worse effects, does any injury to a healthy person. It is common to attribute to it coughs, catarrhs and other affections of the breathing apparatus; but these are not caused directly by its means. A sudden transition from a high to a low temperature, if the body should not be properly clothed, is certainly harmful. When, however, there is exhaustion, as is apt to accompany the heat which follows hard work or active exercise of any kind, it is not doubted that a sudden exposure to cold is full of risk to health.

The rule of safety is to guard against the changes of temperature. Especial care should be taken to protect the person with an abundance of warm covering at the very moment when there is a cessation of heat-

ing exercise of any kind. It is just then, however, unfortunately, that, with the feeling of excessive warmth, there is the least inclination to burden the body with heavy clothing. Boys, and girls too, will thus often, after active play, cast off any easily shifted bit of clothing, and throw themselves, heated and exhausted, on the cold, moist ground. Nothing can be more dangerous. Instead of stripping at this time, they should put on additional covering, and avoid lying down, especially on such a couch as is offered by the bare, damp earth.

With the notion, apparently, that there is something poisonous in the cold air, an immense deal of care is taken that not healthy only, but sick persons shall not be exposed to it. This is particularly so in regard to any one who may be affected with what is generally termed a "cold." The doctor, who, on first entering the bedchamber of a sick person, closed tightly against every breath of outward air, thrust his cane through the panes of the windows, much to the astonishment and horror of a stifling crowd of visitors, feared only the corruption of the atmosphere within, and boldly invited the pure atmosphere from without, with all its coldness. The quick recovery of the patient justified the doctor's audacity.

The usual "petting," as it is called, of a common cold, where there may be merely a running from the nose or a slight cough, without any extraordinary heat of the skin, or any other mark of fever, is by no means the best manner of getting rid of it. It will be found that moderate exercise, in the open air, with a prudent adaptation of the clothing to the weather and season, is the best treatment. Monsieur Dupre, a great French singer, who had every motive for protecting himself against a cold, for each attack was a loss to him of thousands of dollars, declared, as the result of his experience, that it was better not to use too great or many precautions. He avowed that the best protection of all was to fortify the body by exercise in the open air during all seasons and weather.

There is a tendency on the part of one who is subjected to, and begins to feel, the influence of a very low temperature to lie down and sleep. Dr. Solander, who was the surgeon and naturalist of an early arctic expedition, reports that this somnolency was so irresistible in his case, that although he had impressed upon his companions the necessity of not giving way, or letting others give way, to it—for sleep, he knew, under such circumstances is certain death—he was the very first person to yield. Fortunately, his comrades had heeded his lesson, and as soon as the doctor fell back and threw himself upon the ice to repose, they aroused him, and continued to keep him awake, by all the means in their power, notwithstanding his most urgent solicitations to be left alone to sleep and to—die. They succeeded, in spite of his resistance, in disturbing his repeated slumbers, until he finally became wide awake to the imminent danger he had run, and lived to thank his companions for their faithful obedience to his instructions.

Frost-bites, of which the most familiar form is the common chilblain, are best avoided by brisk exercise in the open air, and keeping away habitually from hot stoves and fires on entering the house after exposure to severe cold. Rubbing the frost-bitten part with snow or washing it

rapidly with ice-cold water is the best treatment at first. Subsequently, if the skin should not be broken, friction with spirits, and an occasional bath of hot water with mustard, will be useful. Hartshorn and oil mixed, and the tincture of iodine, are good remedies; and when the skin is broken and an ulcer formed, the best application is what is known to the apothecary as zinc ointment.

CHAPTER VII.

Summer Dress.—Cooling Processes.—Head-coverings.—Franklin's Experiment.—Effect of Colors.—A Philosopher in an Oven.—The Transpiration.—How a Hot Climate is Endured.—Whites and Blacks.—Innocence of the Sun.—Sunstroke.—Its Treatment.—Light.—Effect upon Health and Life.—Rarity of Good Water.—Pure Water of Nature.—How Polluted by Man.

If we could regard merely our comfort, we should probably choose during the hottest weather to go naked, or wear the scantiest clothing, like the savages of some tropical countries. Clothing of some kind being indispensable, even in the hottest weather, it should be so adapted in material and make as to interfere as little as possible with the natural cooling processes of the body. All elaborate dressing, with multiplicity of fold and weight of trimming, must be avoided. To promote the evaporation of the moisture from the surface of the body—which is one of the most effectual means of getting rid of superfluous heat—the covering should be as light as possible. People with no pretensions to philosophy of any kind will instinctively, when free from the fear of fashion, act in accordance with its principles. The heated laborer strips off his coat, bares his sweaty throat, breast and arms, and loosens his girdle. He is thus refreshed by the cold which comes from the evaporation of the moisture of his body on its exposure to the surrounding air.

As in cold weather we cover our bodies with furs, thick woollens, and other bad conductors to keep in the heat, so in hot weather we should take care that the clothing which properly compels us to wear shall be composed of the best conductors, in order to let out as much heat as possible. We therefore must dress in linen, cotton, and such like material.

Of course, in a climate like ours, it is generally thought prudent to wear, even in summer, flannel next to the skin; for, though it has the disadvantage of being a very bad conductor, and keeps in the heat of the body, it has the advantage of being a good absorber of moisture. At any rate, it should be worn over the stomach, which requires to be guarded in hot weather more than the chest, which it usually covers. It is well to avoid the use of linen next to the skin; but cotton, which is the more common wear in the United States, is both comfortable and safe during our summers, with all their possible changes.

To protect the person from the direct rays of the sun, umbrellas and parasols are carried, and wide brim hats worn.

There is a familiar experiment, first made by our countryman, Benjamin Franklin, which proves that the color of all materials has a great effect upon their power of absorbing heat. He took a number of pieces

of cloth of the same size and kind, but of different color, and placed them on a bank of snow, exposed directly to the sunshine. He soon found that the snow melted more rapidly under some than others, and discovered that this was in proportion to the darkness of their tint. The snow under the black cloth was the first, and that under the white last to melt. He accordingly drew the inference that the absorbing power of heat of dark substances was greater than that of the lighter color. The result of this experiment has been acknowledged as establishing a scientific principle which practical people have confirmed by the experience of habitual usage. White garments have been found to be much cooler than dark ones of the same material. When a boy, therefore, throws off his jacket, which is ordinarily of some deep color, and exposes his shirt-sleeves, in hot weather, he cools himself by two processes. He not only lets out internal heat by getting rid of a bad conductor, but keeps off external heat by substituting a bad absorber for a good one.

A white or light-colored straw hat will, of course, be cooler to the head than a black or dark-colored one. As the hair, if it is possessed in ordinary abundance, will generally be a sufficient covering in all seasons, it may be doubted whether a black hat, of any material, is ever necessary. If fashion were less peremptory, and people were allowed to regard their sense of comfort more, the white hat would be oftener seen even in winter.

A famous English philosopher tells us that he went into an oven hot enough to broil a beefsteak, and remained there until one was thoroughly cooked. He moreover states, that during the whole time he bore the heat without much discomfort, and with no serious consequence. He took care, however, to protect his hands and feet with several layers of felt, or some other bad conductor, lest the contact with the pavement or the walls of the heated oven should broil his flesh, as well as that of the cooking steak. While making this experiment of his power of enduring heat, the philosopher, as may be readily conceived, was constantly in a state of profuse perspiration. When the heat is great, there is an abundant transpiration, the moisture of which, on evaporating, produces cold, and thus checks the increase of warmth, come from whatever source it may. It was by this means alone, in fact, that he was preserved from a broiling as thorough as that of the dead piece of meat at his side. People living in hot countries, by the same means, are able to live in good health and tolerable comfort during the hottest weather.

Negroes, or dark-colored people of some kind, are provided with a charcoal like substance under the skin—from which its tint comes—that seems to protect their bodies from the ill effects of prevailing heat. In Africa, the East Indies, and other hot climates, the white people of European descent, although able by natural endowment and prudent precaution to enjoy comfort and health in a more or less passive state of repose, cannot easily or safely vie with the dark native races in bodily activity while exposed to a tropical sun.

People are apt to be unnecessarily timid of exposure to the rays of the sun. They seem to fear them as some old fashioned folk do the light of the moon, as if they attributed to solar as to lunar radiation an influ-

ence fatal to mortal wits. It is now acknowledged by sensible persons that there is no danger to be feared from the moon, and it may be doubted whether the sun is a much more reasonable cause of alarm.

There is a serious affection called sun-stroke, which is generally supposed to be a direct effect of the solar rays, but is oftener due to the exhaustion from hard work, or severe exercise while exposed to them. While people may generally without harm, and even with benefit, bask in the summer sun, it is not safe for them to move actively, as in severe work or exercise, if its rays are striking directly upon their heads.

Shady places should be sought on every occasion of active out-door amusement during the hottest part of the day, and all temptations to long runs and great efforts of strength in the broiling sun be avoided.

In any case of sunstroke, or great exhaustion from exercise while exposed to the heat, the first thing to be done is to remove the sufferer from the causes which are supposed to have produced it. He should be carried to the nearest shade, or, at any rate, protected from the sun's direct rays, wherever he may be, and made to lie down at full length, and cold water applied at once to his head and lips. His lower limbs should be kept warm, with such covering as there may be at hand, and his neck and body freed from any close-fitting garments or binding article of dress. Most will revive readily under this simple treatment.

The gardener who cultivates celery for the table is careful to heap the earth about it so as to exclude the sun's light, in order to give it the whiteness and tenderness which are required to please our artificial taste. Greenness and toughness are its healthy qualities, but we prefer its diseased ones. The same effect follows the same cause in human beings. Foolish women, however, who seem to think that they are only created to be looked at, and, with the false idea that tenderness and paleness are essential to beauty, are as careful as the gardener with his celery to shut out light of the sun, lest they should have too much color and vigor to please the fashionable taste. They pull down the blinds at home, and spread their parasols whenever they go out, and thus take care not to let a glimmer of sun on any occasion brighten or invigorate them.

Miners who spend their few days beneath the surface of the earth, and the many miserable inhabitants of large cities who are compelled to make their abodes in cellars and other holes burrowed into it, soon become sick and quickly find a grave.

Not only is the sun's light a good preserver of health and vigor, which every healthy person, young or old, should freely avail himself of, but it is one of the most useful remedies for weakness and disease. It is the practice in the Child's Hospital in Paris to arrange the little patients in successive rows upon a broad wooden structure, and expose them on every clear, warm day directly to the rays of the sun; taking care, of course, as should always be done, to protect the eyes from the glare. Nothing is found to offer these weaklings such a chance of becoming strong enough to keep and enjoy life. "Second only to their need of fresh air is their need of light," says Miss Nightingale, in the account of her great experience with the sick. "After a close room, that which hurts them most is a dark room, and it is not only light, but direct sunlight they want."

There is nothing so hard to find nowadays as a glass of good water. I is no fault of Nature, for she supplies this essential element of life in great abundance and purity. Her grand process of distillation is ever going on, by which she raises from exhaustless oceans clouds of vapor, and pours down from them showers of rain and storms of snow upon the vast surface of the earth; and thus fills and refills the bubbling springs, the countless trickling rivulets, the mountain torrents, the meandering streams, and great rivers, which, after the beneficent purpose of this glorious gift of water to the world has been effected, return it to the source whence it came. Here, in the grand laboratory of nature, it is again made fit, and sent to renew, in vapor, cloud, spring and stream, its generous service; and thus it goes throughout all time, from ocean to river, and river to ocean.

Water is not only naturally supplied in exceeding abundance, but in great purity, for the use of man. The rain, if collected anywhere away from the touch of human pollution, will be found to be almost chemically pure. The water which nature supplies contains something more than the two gases, hydrogen and oxygen. Even the rain-drop is always impregnated with the various matter met with in the air during its fall from the cloud to the surface of the earth. Rain-water, even, has a flat, disagreeable taste to those unaccustomed to drink it. Carbonic acid gas in certain proportions, and other constituents ordinarily found in unpolluted springs and fresh streams, seem essential to the flavor of drinkable water. Notwithstanding the abundance of the natural supply, it is a very difficult matter indeed to obtain the smallest quantity of wholesome water. All its sources, showers, springs, rivulets, and rivers, wherever they fall, rise, and run within the easy reach of man, are very apt to be polluted by his touch.

Civilization has its bright side, and its dark and dirty side, too, in the dingy shadow of which all civilized men should hide their heads in shame. There is nothing so disreputable to so-called modern progress as the complacency with which it continues to flounder in its own filth. The artist cannot give reality to his conception of grace and beauty without dribbling paint, or raising a dust, or making a stain or a litter. All the great works devoted to the supply of material for the use and enjoyment of civilized beings, whatever may be its nature, are producers of filth. This, moreover, is often the greater as the manufactured product is the more delicate. The oil which we burn, and the soap and perfume which scent the hands and the handkerchiefs of the exquisite, are of so foul an origin that neither the sources from which they come, the processes by which they are made, nor the waste substances they leave, are endurable within smelling distance, and are universally pronounced nuisances.

It is this foul waste matter of various contrivances of civilization for adding to the beauty and happiness of life, which so greatly pollutes the sources of the water which is supplied by nature in such abundant purity. The smoke, vapors, and dust rising from every inhabited town or city, turn each drop of rain, pure as it may have fallen from the heavens, into a drop of poison before it reaches the earth. The sweepings and refuse of the houses, shops, and streets, and the offal of the

shambles, and the waste products of manufactories of all kinds, borne away sooner or later into the streams and rivers, contaminate them. Mankind have been so eager to satisfy the demands for work, that they have not taken time to clear away the litter. Thinking only of the immediate profit, from the urgently required and quickly dispatched article, they have failed to calculate the future loss to health and happiness from the permanent nuisance. Thus their abounding waste is left to accumulate, or flung carelessly aside, to be washed away and mix with and poison the water-sources, which become in this way one of the principle means of producing and disseminating disease.

CHAPTER VIII.

Poisoned Water.—Diffusion of Cholera and Typhoid Fever.—Germs.—Death and the Dairy-man.—The Necessity of Water.—Prejudice against Water as a Drink.—Precautions to be taken in drinking Water.—Suitable Beverages for the Young.

With the dirty habit that so-called civilized people have of casting all their filth into the nearest stream or river, and crowding pigsties, cow and stable yards, necessaries, dunghills, dust-heaps, cesspools, and the various receptacles of dirt close to springs, wells and other sources of the water used, it is not surprising that the water we drink is not only thus made generally unwholesome, but is often turned into a specific poison, so virulent as to cause some of the deadliest diseases that infect the human race, such as cholera, typhus and typhoid diseases, the small-pox, scarlet-fever, or some other pestilence, which attacks whole communities. In certain diseases, as the typhoid fever and cholera, for example, the more common mode of the passage of the germs would seem to be through the bowels of the diseased person, and these are the germs which by the filthy practices of mankind are chiefly allowed to get into the water of common use.

Cholera, whatever may be its origin, is undoubtedly propagated by foul water. The course of the chief water pipes in London was found to indicate exactly the progress of this fatal disease during several epidemics. Those districts where the water thus supplied was foul were struck with cholera, while those furnished with pure water escaped unharmed. In Guilford, a small town in England, two hundred and fifty cases of typhoid fever occurred within the short space of a single month. The district in which they happened was found to be supplied with water from "a reservoir filled from a new well, which, through the drainage of a fissured chalk stratum, received the soakage of several sewers."

Not long since, there broke out in one of the most fashionable quarters of London a frightful epidemic of typhoid fever. As case after case occurred, rapidly following one another, it was noticed that the disease was confined to certain houses within a fixed boundary. It was discovered that they were all supplied by the same dairy-man, and that his daily course in distributing milk corresponded exactly, house to house, row to row, and street to street, with the march of the typhoid fever. It was ascertained that a laborer had died of typhoid fever on the farm whence the milk was obtained, and the common receptacle of

all filth, that of the diseased man included of course, was found to be so close to the source of the water in daily use that the contents of the two could not fail to intermix with each other. It did not appear that the fatal milk had been "watered" by this horrible mixture, but it was acknowledged that the cans had been daily washed, if such a term can be used, with it. Thus the germs which had passed from a single laborer, dying of typhoid fever, in the country cottage of a dairy-man, had been conveyed to the great metropolis, and poisoned a large number of the inhabitants of one of its most opulent and apparently best-protected districts.

Beer, wine, spirits, and the various other kinds of fermented liquor so universally drunk, find the best apology for their use in the difficulty of getting pure water. The pollution of springs, wells and streams becomes thus a source of moral as well as physical corruption, and that most degrading vice, drunkenness, is greatly due to the scarcity of pure water. There is in many countries such a prejudice against water as a drink, that it seems almost to have gone out of use for that purpose. There is nothing which so much astonishes a native of Germany and France as the call by an American traveler for a glass of water. This common aversion to water as a beverage, and the general opinion that it is unwholesome, come probably from the fact that it has been found by experience to be a frequent cause of disease. That it should be so is not surprising, for throughout the continent of Europe there is an almost universal ignorance and disregard of the laws of health.

Children, in the heat of play, are ready to quench their thirst at any source the most convenient. They make no inquiry and heed no warning, but will scoop up handfuls of water out of the first running creek, or open their mouths at the spout of every corner pump. Water, if pure, may be drunk at any time and in the greatest abundance, but there is a method which must be strictly followed in swallowing it. It should never be gulped down, as it is apt to be, by children who will drink a full tumbler without drawing breath. The first mouthful should be completely swallowed before a second draught is taken; and if the drinker is heated, the water should only be sipped, with frequent pauses after every sip or two. With these precautions, the coldest, even iced, water, and in abundance, can be drunk with perfect safety under any circumstances, whether of health or sickness.

There is no beverage which can be safely substituted for water, for the use of youth, at least. They had undoubtedly better not take even tea or coffee, however diluted. Wine and spirits should never be touched by children, not so much on account of their immediate effects, which are not without risk, but for fear of creating by habit the unnatural taste, for such it is, for strong drink, the fatal consequences of which to decency and virtue of life even the youngest must be aware of.

CHAPTER IX.

Digestion.—Mastication.—Teeth.—Use and Abuse.—Saliva.—Use and Abuse of Taste. — Swallowing.—Its Dangers.—Mr. Brunel's Escape.—Remedies for Choking.

As most food, before it is fit to be eaten, has to undergo certain processes of preparation, so when taken into the body it can only be adapted to the purposes of life after being subjected to various operations. These are described under the general term of "digestion," a complicated function composed of many parts, which, being somewhat similar, may be compared to the familiar process of cooking.

The cutting or chopping of the various articles of food by the cook to make them yield more readily to the boiling, roasting, stewing, frying, and other kitchen doings, is like the first process essential to animal digestion. This is called "mastication," or "chewing." The instruments for the purpose with which the human body is supplied are termed "masticators," but are much better known under their familiar name of teeth. Mastication is a very important yet simple process, but it is apt to be ill performed, or not at all. Children are generally very negligent of this necessary work. Possessed naturally of the best possible tools in their regular sets of firm teeth, they are applied to every imaginable purpose but the right one, the masticating of food. A child will delight in splintering a pignut, impenetrable to the sharpest-toothed squirrel, but will scorn to use a tooth in crushing a morsel of bread or dividing a bit of tender meat. The food of most animals requires to be well broken up, and softened almost into a paste, before it can be properly acted upon by the various other processes essential to good digestion, and consequently to vigor of health and life.

The bird which apparently gulps down its food whole without first chewing it, has an apparatus which serves the purpose of the set of teeth it has not been provided with. Its gizzard is composed of an exceedingly thick and strong hollow muscle which contracts upon the food, and greatly assists the grinding power of that masticating organ. Every one who has any experience of keeping tame birds is well aware of the necessity of spreading earth or sand on the bottoms of their cages, that they may have the chance of furnishing themselves with the pebbles or gritty particles essential to the due breaking-up of their food.

Children should learn that it does not matter how easy to swallow the morsel may be, it requires to be well chewed and turned about in the mouth, and should never be boited whole. Children must remember that they are not boa-constrictors, but animals provided with teeth expressly for the purpose of chewing. Hasty eating is not only an offense against decorum, but is often the cause of the disease termed "dyspepsia," and of various serious derangements of the stomach and other organs of digestion. The teeth must be kept in a proper condition. They are tools well tempered and of great durability.

It is common to treat the first set of teeth—which begin to show themselves in infancy, and continue to come in succession until they reach, at the early age of eight or nine, from twenty to twenty-four in number—as of very little importance, and hardly worth any care, since they last only to the eleventh year. This, however, is a grave error, for

the beauty and strength of the second set, or the thirty-two *permanent* teeth, as they are termed, will depend a good deal upon the treatment of the first, or twenty four shedding ones. They are closely related, for hardly is one of the latter fully developed when another of the former begins to grow beneath it, and what is harmful to either will be apt to be so to both. The first teeth should be kept clean by daily washing of the mouth in the earliest periods of childhood, and in the more advanced by the use of a very soft brush. The attempt to crack nuts and gnaw ivory buttons, or to do anything, in fact, by which the teeth are jarred severely, or may be chipped, will not only injure them, but seriously damage the prospects of their successors. The common impatience to get rid of the first set of teeth leads to the working at them when they may be a little loose. It is a bad practice. They may, at the last moment, when their hold is of the slightest, be aided by the gentle effort which will only be required to detach them.

The *permanent* teeth should be cleaned at least twice a day—on rising from and going to bed—and it would be well, also, to rinse out the mouth after each meal. A soft brush only should be used, and nothing but pure water will be necessary if the cleansing of the teeth is frequent. When from neglect they have been allowed to become dirty, a little of the finest soap may be employed. All fancy powders and washes should be avoided, for, however good their immediate effect may seem, their habitual use will probably destroy the enamel of the teeth. This enamel, which covers the upper part or crown of the tooth, as it is called, is certainly a very hard substance, but even it will yield to constant friction of hard or application of acid substances. It also is apt to be chipped off by being brought suddenly and violently into contact with any hard material, whether it be hickory-nuts or musket-balls; and if it should be chipped off or otherwise destroyed, the decay of the tooth will be sure to follow.

The shock, moreover, which the tooth receives from cracking nuts, or attempting to crush any excessively hard substance, will loosen it from its socket in the gum, which will become, in consequence, detached from its connection with the crown of the tooth, which is there protected by its coat of enamel, and, shrinking, expose the root of the tooth which, being unguarded, will soon yield to decay.

It is not enough for the food to be cut up by the front teeth and ground by the back ones. It has to be moistened, for otherwise it could not be readily swallowed. While the chewing is going on, the food becomes mixed with the *saliva*, or spittle, supplied by little glands inside of the mouth. This is a fluid composed of water and a small quantity of albumen and some soda. These have not only the effect of smoothing and making the chewed and moistened food slippery, that it may be more easily swallowed, but also dissolve it to some extent, and thus assist in preparing it for the uses of the body. The habit of throwing saliva from the mouth on every occasion, or polluting it with tobacco-juice or anything else, is not only nasty, but harmful.

By chewing, the morsel is turned round and round in the mouth and, being thus brought into close contact with the tongue and the palate, where there are nerves especially provided, is fully tasted and its flavor

extracted. This taste is given us both as a motive to take food and as a means of judging of the proper kind. The tongue and palate, therefore, not only administer to our pleasure, but watch over our safety. They are ordinarily faithful servants if not spoiled by over-indulgence or by brutal treatment. Young people should check their excessive fondness for sucking sweets, their great proneness to imitate older fools in chewing and smoking tobacco, and their own frequent practice of exercising their jaws and powers of suction upon the tough india-rubber, the flinty rattan, and other substitutes for the sickening quid and cigar.

The morsel of food being well chewed, softened, smoothed and tasted, is now, if acceptable, swallowed at the will of the eater. The windpipe and the gullet lead from the mouth to the interior of the body. Through the former the air passes in and out of the lungs, and through the latter the food enters the stomach. They both open at the back part of the mouth close to each other, the windpipe just in front of the gullet. There is a lid attached to the entrance of the former, over which all food must pass to get into the latter. This lid is ordinarily closed during the act of swallowing, and the food passes readily over its smooth surface into the opening of its proper passage, the gullet. Sometimes, however, this lid is suddenly opened just as the morsel to be swallowed reaches it, and then the food gets into the opening of the windpipe—*going the wrong way*, as it is familiarly called—when that sputtering and coughing ordinarily occur which so frequently happen, especially to young people, when eating. The sputter and cough are the means by which the windpipe tries to get rid of the intruding food; and, fortunately, these generally succeed, or very great mischief might occur. Children are often told not to speak while they are eating, and they would do well to obey the command, not only for politeness, but for health and life's sake.

An accident which befell Mr. Brunel, the famous English engineer, who designed the gigantic *Great Eastern* steamer and completed the construction of the Thames Tunnel, will show the danger there is of whatever may be in the mouth falling into the windpipe. Mr. Brunel was pretending, greatly to the delight of a group of little children, to swallow a sovereign, the English gold coin so called. He had put it in his mouth for the purpose of his playful deceit, when he was suddenly tickled to laughter by the startled surprise of the credulous youngsters about him, and the piece slipped into his windpipe. All the usual efforts of sputtering and coughing proving of no use in getting it up again, he gave over in despair, and summoned his doctor. His attempts, however, to extract the sovereign were in vain, and he called to his aid some of the most eminent surgeons of London. After they had resolved upon the serious surgical operation of cutting into the throat, Mr. Brunel cried out, "Turn me upside down!" Fortunately they did as they were bidden, and, taking the patient by the heels and lifting them up, while his head was allowed to hang down, they gave him a vigorous shake, and out came the sovereign, rolling upon the ground.

Hasty guzzlers, however, will sometimes, in their voracity, attempt to swallow such enormous masses of food that they are too big for even

the exceedingly great capacity of the gullet, and they may accordingly stick in their course. Death has sometimes ensued in consequence; but generally, in case of a stoppage, a patient, natural effort will succeed in removing it.

A fish or any other bone or sharp hard substance will be sometimes incautiously taken into the gullet and stick. In such a case, an attempt to bring it up again will generally succeed, if the finger be thrust well back into the throat, so as to tickle it and to cause a reverse movement, as in vomiting. Swallowing, too, a morsel of dry bread will often effect the purpose by driving down the clogging or sticking substance.

CHAPTER X.

Action of the Stomach on Food.—Effect of Activity of Body and Mind. Chyme.—Beaumont's Experiments.—Comparative Digestibility of Different Food.—Variety.—Feeding Children.—Proper Diet for them.

The food or whatever is swallowed passes through the gullet into the stomach. Here it undergoes the chief process of digestion, which in this stage is very like, indeed, the operation of cooking. Heat, moisture, movement and a solvent are the essential requirements of each. The stomach has in its natural heat a substitute for the kitchen-fire; in its gastric juice, a liquid which it pours out whenever its digestive action begins, a supply of both the water and salt indispensable to the purpose of the cook, and by its constant contraction and expansion it keeps up a movement which the constant stirring of the pot could hardly equal.

As soon as the food enters, there is a rush of blood toward the stomach by which its heat is increased to the proper degree necessary for the digestive operation it has to perform. It is owing to this that so many persons feel, after eating a full meal, a sensation of cold over the whole surface of their bodies. This effect, if not excessive, may be regarded as a good sign, inasmuch as it is an indication that the process of digestion has vigorously begun. On the contrary, when there is flushing of the face and an uncomfortable sense of general warmth, it is a proof that the stomach is oppressed by some cause or other, and, not being in working order, refuses the supply of blood or heat which it would otherwise accept.

Active exercise after a plentiful meal is rightly regarded as unwholesome. There can be no vigorous movement of the limbs for any length of time without causing a rush of blood toward the surface of the body, and accordingly checking its flow to the stomach, and thus depriving it of the heat essential to its work of digestion.

Children are advised to postpone, until a half-hour at least after each solid repast, the running of races, skipping of the rope, baseball and all other games and amusements which require considerable effort. We urge upon the children the necessity of avoiding all hard study immediately after meals. Intellectual exercise is no more consistent than is physical exertion. They should never set children to work at their

lessons until a full hour after the solid meal of the day. Whatever enters the stomach is turned into a pulpy kind of substance termed *chyme*.

Some liquids remain unchanged, and pass at once from the stomach into the general system, and thus the quick action of various deadly poisons are accounted for. Alcohol may be regarded as one of these. If it does not kill as rapidly as some others, its power is immediately shown in a way which leaves no doubt that it has begun its deadly mischief. On examining after death the bodies of persons who have died of drinking whisky, brandy or other spirits, the alcohol, which is the chief part of these, has been found in the brain unchanged in its course through the body. There can be no doubt that this subtle liquor is no sooner swallowed than it starts for the head, where it quickly arrives, in spite of the long zigzag paths it may have to take, and begins at once its mischief. Quick as it goes, however, it does not fail to leave on its way harmful traces of its fatal touch. However small the quantity swallowed, the effect of alcohol on the brain is observed immediately in the excitement of that sensitive organ, and shows itself even in the dullest person by an unnatural wakefulness of expression, liveliness of manner, and freedom of talk. These effects are probably the chief motives which incline stupid and woe-begone folk to the use of this dangerous spirit. This excitement of the brain, moreover, by alcohol is what induces the physician to have recourse to it as a remedy in cases of illness where a sudden arousing of the nervous system may be thought urgent, as in the prostration from low fevers, fainting, sunstroke and exhaustion from excessive fatigue. All prudent doctors, however, use this, as other poisonous medicines, with the greatest caution, and only in cases of emergency. Some physicians are so conscious of the dangers of alcohol, that they have even banished it entirely from their list of remedies.

To young people, especially, alcohol in any form is particularly harmful. Children have been frequently poisoned to death by whisky, brandy and other strong drink which they have taken, heedlessly, of their own accord, or been induced to swallow at the suggestion of brutal drunkards. All spirituous liquors, of whatever kind, and however agreeable to the taste as they are often made by sugar and syrups of various sorts, must be shunned like every other poison. Water, too, is quickly absorbed upon being taken into the stomach, and a great quantity must be swallowed, either pure or mixed, for it forms about nine-tenths of the whole composition of the body.

Although the stomach is forced to receive all substances the gullet is voracious enough to swallow, it is not always able to make use or readily to get rid of them. It has only a narrow opening called the *pylorus*, or "guard at the gate," at the end where it connects with the adjoining bowel, adapted for the passage of the half-fluid chyme. When, therefore, the stomach gets hold of something which is too hard to be turned into this soft substance, or too large to pass off with it, it is apt to remain for some time, at least, and do a great deal of mischief.

Death has occurred from swallowing peach and cherry stones. There is a specimen in the College of Surgeons of Edinburgh of a portion of bowel taken from the body of a child. The bowel is enormously en-

larged beyond its natural size, and is packed as tight with cherry stones as a winning boy's bag with marbles. Death, of course, was the consequence, and it only seems surprising that it does not oftener occur.

A young gentleman of New York died, after very severe suffering, from a cause which greatly puzzled his physicians until, examining his body after death, they found a small piece of oyster-shell sticking in a part of his intestine and perforating it. This fatal bit had probably been swallowed unconsciously in that every-day act of taking a rapid lunch, and proves how necessary it is to avoid haste and carelessness in swallowing the simplest meal or food.

Judicious parents will take care that the child's table—as, in fact, their own—should never contain anything but what is wholesome and digestible, and insist upon their children strictly obeying the rule of eating what is set before them. There is no reason why the diet of a child in its teens should differ from that of a grown-up person; although the latter, if in full health and activity, will require a larger quantity of solid food. The appetite, however, of the youth is apt to be very great, and his requirements, moreover, large, to supply the waste from the excessive mobility, and the material for the rapid growth of that period of life. If the food is plain and substantial, there is little necessity of checking a child's voracity. He may safely be left to roam at will over any extent of stale bread, or plunge into any depths of homely porridge and hominy, without a muzzle to appetite; the instinct of which, aided by that of a simple taste unperturbed by luxury, will prevent all likelihood of excess. Give the child, however, the freedom of the pastry-cook's shop, and he will eat and eat, cram and cram, and ask for more, unchecked by anything less than a colic or a vomit.

CHAPTER XI.

Children's Likes and Dislikes.—Idiosyncracies.—Variety Essential to Children.—The Child's Table.—Regularity in Eating.—Proper Hours for Meals.—Before, at, and after Meals.—Dangers of Careless Children.

Children are apt to express likes and dislikes of this or that kind of food, which have no other basis than mere fancy. Sometimes, with the very decided protest, "I can't eat *that*," they will obstinately refuse every member of the vegetable kingdom and set their teeth against flesh of this or that especial variety; and again, they will not taste fish or fowl.

There are no doubt peculiarities of constitution that certain persons have, which not only give them an aversion to the flavor of some particular and generally acceptable food, but prevent them from digesting it. We know a gentleman who always turns away with disgust from a proffered strawberry. There was also a lady of our acquaintance to whom the smallest portion of any kind of fish would act with the promptitude and certainty of the most powerful emetic. Parents are often wrong in urging upon a child certain kinds of diet in excessive quantity merely because they believe them particularly healthy. Having heard that fatty substances are useful remedies in certain diseases, many parents undertake an active oleaginous course of treatment

in their families, doubly buttering the daily bread, picking at the bits of yellow fat from the dinner joint, and thrusting them down the throat of each youngster, as if he were a *blubberous* Esquimaux. Fat may be conceded to be not only a useful, but an essential part of human diet; but it is not necessary—in fact, it is unwholesome—to gorge people with it in a temperate climate.

It is a common error of parents to suppose that a child's food must be entirely limited to two or three simple articles of diet. To exclude butter, sugar, and some of the various condiments absolutely, is a mischievous mistake. If fed solely upon plain meat and potatoes, rice or porridge, milk or dry bread, their taste soon becomes wearied with the vapid uniformity, and they thus acquire a disgust for these and like articles of diet which would continue to please if they were presented to them in due proportion and variety. Food, to answer fully its purpose in the human economy, must not only be of a nutritious, but of a palatable nature.

The common meal of grown-up people and children should be uniformly simple, that they may both partake indiscriminately of its healthful abundance without chance of mischief to either. In a well-arranged plain family dinner, the most substantial and nutritious articles of diet come first, and the less substantial and nutritious last. True, it is customary to take the soup at the very beginning of the meal; but this, though a fluid and apparently an exception, is, if well made, really one of the most nourishing of foods. At a properly set meal there is little fear of a child eating to excess, provided he has been taught to take the food in the order provided. There is no reason why young people should be deprived of their prerogative of pie, or any privilege of dainty, if the food be wholesomely prepared; but they should be made to understand that such things are to be regarded as subordinate to the more nutritious meat and vegetables, which ought to form the main part of the dinner.

We Americans are apt to do everything in haste, and in nothing do we show our characteristic hurry more remarkably than in the expeditious manner in which we dispose of our superabundant meals. An Englishman relates that he called upon a business man in one of our cities, and found the door locked and a notice upon it which read: "Gone to dinner—will return in five minutes." What time is gained in this way is dearly paid for by the discomfort and ill-health which are sure to follow, as nature is not to be hurried with impunity by the impatience of man; and if pushed or interrupted, will either do her work imperfectly or stop it altogether.

Children are supposed to be in a perpetual state of hunger, which is rather owing to the constant desire of pleasing their taste, than of satisfying the cravings of their stomachs. It is possible that some children, especially when very young, may require to be fed oftener than the three established meals would allow. The practice of munching tit-bits of any kind, fruits, pastry, and sweets, at any and each moment of the day, takes away the appetite for the regular meal, and weakens and irritates the stomach by keeping it in a constant state of useless activity.

People should not hurry through their meals, nor sit down to them without a certain deliberateness and preparation.

CHAPTER XII.

The Muscles.—Their Nature and Action.—Exercise.—Its Effect on the Muscles.—Muscular and Fat People.—Cure for Fat.—Natural Exercise.—Checks of Gentility, Dress and Fashion.—Precocious Fine Ladies and Dandies.

The flesh, as we ordinarily call it, of our bodies is mainly formed of what the anatomists term "muscles." The purpose of these is to produce various movements, most of which are under the entire control of will, some only partly so, and a few not at all. The arm and the leg have muscles of the first kind, which are moved, as we know, at our pleasure. The throat has muscles of the second kind, which are put into motion in swallowing—a process at one time voluntary, and at another involuntary; and the heart has muscles of the third kind, which act altogether independently of the will.

Exercise is merely putting into motion the muscles which we can move at our will. In walking and running, boxing and wrestling, and in most active sport, there is a constant muscular expansion and contraction. The effect of such exercise upon the muscles is very advantageous, though the benefit is by no means confined to them alone. The frequent use of a muscle endows it with a greater power of fulfilling its purpose. Look at those laborers stripped to their work, who are ever wielding the pickaxe and sledgehammer. What brawny figures they have! What bull-like necks! What surging chests and mighty arms, of a mould hardly less firm and a substance hardly more yielding than the iron instruments which they use as deftly and easily as if they were parts of themselves! The shrivelled shanks and the dangling arms of skin and bone of the lazy loungee at home are the natural results of letting the muscles shrink away for want of use.

Fulness of bodily size by no means implies largeness and strength of muscles. Little exercise and much feeding will produce a great deal of fat, which soon wraps the whole body in its soft folds of blubber, and leaves no space for flesh or muscle, and even turns it, if it should exist by chance, into its own substance. A young person of good constitution and vigorous appetite, if prevented from taking part in the active life of youth, is apt to become excessively fat. He should be tossed and tumbled on the play ground until the softness of his fat is squeezed out, and the laziness of his bones shaken off. His diet should consist mainly of stale bread, meat, hominy, or oatmeal and milk, and he must be kept on a small allowance of the habitual sugar and a still smaller one of the extra sweets, such as cakes and pastry. He should both go to bed and rise early, and be allowed to lie only on a hard mattress and under coverings warm enough, but not too heavy or close.

Girls have a greater tendency to become unduly fat than boys, for they get less chance of exercising their bodies, and if they desire to be healthy and strong, they are advised to get rid of it by eating less and exercising more.

The best muscular exercise for young children is the movement to which they are led by their natural playfulness. They, if left to themselves, will run, tumble, and toss and wrestle with each other like sportive kittens. Nothing can be more favorable for the just development of the muscular system, and, in fact, for vigorous growth and

sound health, than the graceful motions of a child in the free indulgence of its playful moods. The dress of children should always be made so light and loose as to admit of the freest movement of every muscle and part of the body. Tight hats, tight waists, tight sleeves, tight garters, tight shoes and tight collars must be shunned, together with padded bosoms, over-weighted bustles, and draggling skirts. It is quite impracticable for children to clothe themselves as fashionable men and women, and act physically, at least, as children should.

CHAPTER XIII.

Formal Exercise.—Skating.—Swimming.—Riding.

Boys and girls seldom submit very willingly to any formal system of exercise. They much prefer to run, toss and tumble, at their own free will, away from the watchful eye and directing hand of parent or guardian. Left to their natural impulse to activity, they will take plenty of exercise, and it is surprising how much they can bear without any sense of weariness. In the companionship of lively comrades of their own age, they will go through a prodigious quantity of play and exert more muscular force than would be required for any hard day's work, without even the consciousness of an effort.

Skating is one of the best possible of exercises, for its movements are easily controlled by the will and adapted to every varying strength, while its excitements are equally pleasurable to all, both young and old.

Swimming, besides its obvious advantage as an additional security to life, is one of the best forms of exercise. All boys and girls can and ought to be taught to swim. A dozen lessons, earnestly and patiently given by a competent instructor, will be enough to make any youth of either sex sufficiently confident of his or her power, and conversant with the art to pursue it to perfection without further aid. A bather must never enter the water immediately after a hearty meal. He must not plunge into the cold water while excessively fatigued and heated with exercise. The practice, however, of stripping off the clothes and cooling the body by exposure to the fresh air is not a good one.

Horseback exercise has every advantage but its costliness. In schools the supply of a few horses or ponies, and a division of the expense among all the pupils, would give each, at a very small cost, the opportunity of learning that most excellent art of horsemanship, as it has been justly called.

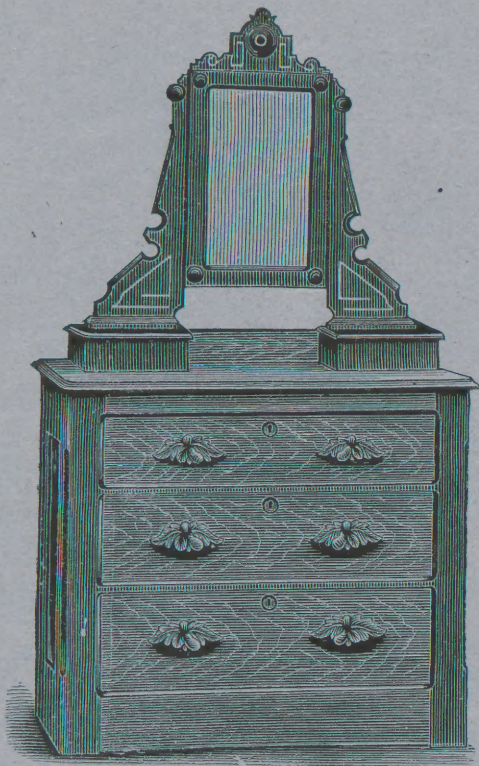
The graceful and healthy development of the body may be seriously deranged by the habitual postures taken while standing.

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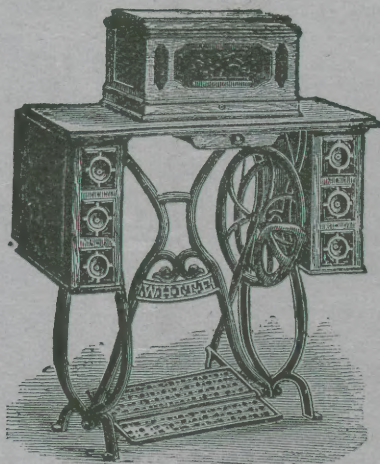
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